BIODIVERSITAS
Volume 21, Number 4, April 2020
Pages: 1467-1475

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d210426

Characterization of soil properties in relation to *Shorea macrophylla* growth performance under sandy soils at Sabal Forest Reserve, Sarawak, Malaysia

IZWAIDA CHE ADANAN♥, MOHD EFFENDI WASLI, MUGUNTHAN PERUMAL, HO SOO YING
Faculty of Resource Science and Technology, Universiti Malaysia Sarawak. 94300 Kota Samarahan, Sarawak, Malaysia.
Tel. +60-11-10959095, ♥email: izwaidacheadanan@gmail.com

Manuscript received: 16 December 2019. Revision accepted: 18 March 2020.

Abstract. *Adanan IC, Wasli ME, Perumal M, Ying HS. 2020. Characterization of soil properties in relation to Shorea macrophylla growth performance under sandy soils at Sabal Forest Reserve, Sarawak, Malaysia. Biodiversitas 21: 1467-1475.* A study was conducted in the Sabal Forest Reserve, Sarawak, to characterize soil properties in terms of soil morphological and physicochemical properties under sandy soil at the reforestation site in comparison with High Conservation Forest soil as well as to assess growth performance of planted *S. macrophylla* under the sandy soil. Study sites with the size of 25 m x 25 m were established under reforestation sites (Early Establishment of Reforestation Site (ER) and Late Establishment of Reforestation Site (LR)) as well as the High Conservation Forests (HCF-1 and HCF-2). The results from soil morphological properties showed that the soils in ER and HCF-2 plots resemble Saratok series while soils in LR and HCF-1 plot were classified into Buso series. As for soil physicochemical properties, soil in all study sites were strongly acidic in nature with pH (H_2O) value less than 5.00 with sandy (more than 55%) at both surface and subsurface soil. The survival percentage of planted *S. macrophylla* in ER and LR plot was 65 % and 56%, respectively. Long term monitoring on soil properties and growth performance of planted *S.marophylla* tree are essential in order to continuously provide information on the status of reforestation activity.

Keywords: Grey-White Podzolic soils, growth performance, Podzols soil, *Shorea macrophylla*

INTRODUCTION

The Heath Forest in Sarawak is known as "Kerangas" Forest, originating from an Iban word that refers to infertile soils (Brunig 1974). It is a seasonal lowland tropical rainforest that develops in dryland sites with predominantly podzolized, highly acidic and sandy soils (Brunig 1974; Ghazoul and Sheil 2010). Besides, sandy soils were recorded as least fertile compared to alluvial and sandstone forests (Dent et al. 2006). The free-draining sandy soils allow nutrients to leach readily (Katagiri et al. 1991; MacKinnon et al. 2013). Besides, heath forest soil also degraded quickly to bleached sand once the forest cover is removed making this type of forest extremely fragile. In addition, Jordan (1985) points out that the nutrient contents are in critical condition in the tropical rainforest and human impact influenced nutrient cycling. Moreover, heath forest is easily degraded by logging and burning and once degraded, heath forests develop into an open savannah of shrubs and trees. The disturbance such as forest fire would destroy the surface litter layer and root mat and take time to recover (Brunig 2016).

Therefore to combat soil degradation, a rehabilitation attempt was conducted at various types of degraded forest land. One of the promising methods to restore the degraded forestland was by adopting enrichment planting. Through enrichment planting, forest stands with uneven distribution of natural regeneration can be stocked as well as increase the soil fertility (Kobayashi 2004; Lamb et al. 2005; Keefe 2008). In enrichment planting, dipterocarps trees such as *Shorea macrophylla* (de Vriese) P.S. Ashton have been selected and widely planted in a reforestation program in Sarawak as it has fast-growing rate and endemic tree species to Borneo island. S. macrophylla or known as "*Engkabang jantong*" (Light Red Meranti) (in Malaysia) and "*Tengkawang hantelok*" (in Indonesia) is classified in the IUCN Red List of Threatened Species which if without proper conservation, could lead to its extinction in tropical rainforests (Utomo et al. 2018; Randi et al. 2019).

Various previous studies have been reported on the progress of reforestation activities to rehabilitate degraded areas at tropical region (Nik Muhamad et al. 1994; Suhaili et al. 1998; Norisada et al. 2005; Arifin et al. 2007, 2008a, 2008b; Hattori et al. 2013; Kenzo et al. 2014; Perumal et al. 2015, 2017a, 2017b). However, a recent study by Hattori et al. (2019) stated that long term monitoring of soil nutrient and biomass accumulation is rare in degraded tropical rainforest growing on sandy soil. In addition, relatively less information is known on the outcome of reforestation practice under sandy soil at degraded forest area via enrichment planting of *S. macrophylla*. Therefore, this study was conducted to characterize soil properties in terms of soil morphological and physicochemical properties under sandy soil at the reforestation site in comparison with High Conservation Forest soil and to assess the growth performance of planted *S. macrophylla* under sandy soil in reforestation sites.